

U.S.S.N. 10/714,058

-3-

GKNG 1181 PUS

IN THE SPECIFICATION:

Please replace paragraph [0025] with the following amended paragraph:

[0025] ~~Figure 5 shows~~ Figures 5A and 5B show an outer joint part of an inventive joint in a longitudinal section ~~with details regarding the first outer tracks and a detail of the same.~~

Please replace paragraph [0027] with the following amended paragraph:

[0027] Figure 7 shows an inventive joint according to the preceding Figures, with six balls:

- A) in an axial view; ~~and~~
- B) in a longitudinal section ~~[[A-A]] B-B;~~
- C) in a longitudinal section through the outer joint part showing the track detail; and
- D) in a longitudinal section through the inner joint part showing the track detail.

Please replace paragraph [0028] with the following amended paragraph:

[0028] Figure 8 shows an inventive joint with six balls in a modified embodiment:

- A) an in axial view; ~~and~~
- B) in a longitudinal section through the ball tracks; ~~and~~
- C) in a longitudinal section through the outer joint part showing the track detail.

Please replace paragraph [0029] with the following amended paragraph:

[0029] Figure 9 shows an inventive joint similar to that shown in Figure 7, with eight balls:

- A) in an axial view;
- B) in a section ~~[[A-A]] B-B~~ through two first pairs of tracks; ~~and~~
- C) in a section ~~[[B-B]] C-C~~ through two second pairs of tracks;
- D) in an axial view; and
- E) in a section E-E through a first and second pair of tracks.

U.S.S.N. 10/714,058

-4-

GKNG 1181 PUS

Please replace paragraph [0030] with the following amended paragraph:

[0030] Figure 10 shows an inventive joint according to Figure 9 in a modified form:

- A) in an axial view;
- B) in a section [[A-A]] B-B through two first pairs of tracks; ~~and~~
- C) in a section [[B-B]] C-C through two second pairs of tracks;
- D) in an axial view; and
- E) in a section E-E through a first and second pair of tracks.

Please replace paragraph [0039] with the following amended paragraph:

[0039] Figure 1 shows the inventive joint in an aligned condition. The longitudinal axes La and Li coincide, and the same applies to the offset points 01 and 04 as well as 02 and 03. The first pair of tracks 22, 23 is characterised in that, in the central plane EM, it opens towards the attaching end, i.e. the tangents at the ball contact points in the ball tracks form an opening angle α which opens towards the attaching end. In consequence, the ball 14₁, when under torque, experiences a resultant force F1 which points towards the attaching end. The first pair of tracks 22, 23 are configured such that when the joint is articulated, the opening angle (α) of the first pairs of tracks, at a ball (14) entering the outer joint part (12) beyond the central plane (EM), changes at a substantially constant rate.

Please replace paragraph [0040] with the following amended paragraph:

[0040] The second pair of tracks 24, 25 is characterised in that the tracks open in the central plane EM towards the aperture end, i.e. the tangents at the ball contact points in the ball tracks form an opening angle β which opens towards the aperture end. In consequence, the ball, when under torque, experiences a resultant force F4 which points towards the aperture end. The track center lines of the ball tracks can be positioned in central planes containing the first and second longitudinal axes La, Li.

Please replace paragraph [0042] with the following amended paragraph:

[0042] In Figure 2, the joint is articulated by an articulation angle γ_1 which is positioned in the drawing plane, with the articulation angle γ_1 spanning between the longitudinal axes La and Li (Figure 4). The central ball plane EK which coincides with the angle-bisecting plane EW is rotated relative to the central plane EM by half the articulation angle $\gamma_1/2$ (not shown), and as a result of a right-turning rotation in the mathematical sense, the ball 14₁ in the first pair of tracks 22, 23 has been displaced towards the attaching end and the ball 14₂ in the second pair of tracks has been displaced towards the aperture end. As a result of the inventive track shape of the first pairs of tracks, which has yet to be explained in greater detail, the opening angle α

U.S.S.N. 10/714,058

-5-

GKNG 1181 PUS

between the tangents at the ball 14₁ in the first pair of tracks has now changed to such an extent that it opens towards the attaching aperture end. Under torque, the first pair of tracks 22, 23 now generates a resultant force F1 on to the ball 14₁ which points towards the aperture end.

Please replace paragraph [0045] with the following amended paragraph:

[0045] In Figure 3, the joint, in the drawing plane, is articulated by a second articulation angle γ_2 which has the same size as the articulation angle γ_1 , but is produced here as a result of a left-turning rotation in the mathematical sense. The articulation angle γ_2 spans between the center lines La, Li. The central ball plane EK which coincides with the angle-bisecting plane EW is inclined relative to the central plane EM of the joint by half the articulation angle ($\gamma_2/2$) which is not indicated here. The opening angles are not illustrated in this Figure. Although in the region of the ball 14₁, the central ball plane EK has already left the first outer ball track 22, the selected track shape ensures that a ball contact point C22 is still removed by a distance S1 from the end of the ball track 22. A ball contact point C23 is also positioned from the end of the ball track 23 by an unspecified distance. The ball 14₁ thus still has a secure contact within the ball tracks 22, 23 and is thus able to contribute to the transmission of torque. The reason for this, i.e. the design of the first ball tracks 22, 23 at the aperture end is described in detail in ~~DE 100 60 220 A1~~ U.S. Patent Publication No. 2004/0116192 A1, the contents of which is herein incorporated by reference.

Please replace paragraph [0046] with the following amended paragraph:

[0046] Figure 4 shows the same joint as Figure 2, with the articulation angle γ_1 in the drawing plane being spanned between the first longitudinal axis La and the second longitudinal axis Li. The opening angles are not illustrated in this Figure. In the region of the ball 14₂ in the second pair of tracks 24, 25 it is shown that the central ball plane EK which coincides with the angle-bisecting plane EW and is inclined relative to the central plane EM of the joint by half the articulation angle ($\gamma_1/2$) has already left the region of the outer ball track 24 at said articulation angle. However, because of the track shape of the second pairs of tracks, it is ensured that, nevertheless, the contact point C24 of the ball 14₂ with the outer track 24 is still positioned within the track by the distance S2. The ball contact point C25 is also remote from the end of the ball track 25 by an unspecified distance. The ball 14₂ is thus still able to participate in the transmission of torque. The design principle of the track is described in ~~DE 107 06 864~~ U.S. Patent No. 6,319,133, the contents of which is herein incorporated by reference.

Please replace paragraph [0048] with the following amended paragraph:

[0048] Figure 5, in greater detail, shows the course taken by the first outer ball track 22 with reference to its center line M22. In the central region, said track describes a curve around the center O1 with a radius R2. The radius R2 extends towards the attaching end and into a plane S positioned perpendicularly relative to the longitudinal

U.S.S.N. 10/714,058

-6-

GKNG 1181 PUS

axis La. The radius R2 is steadily followed by a smaller circular arch with the radius R3 whose center OS is positioned on the plane S, thus achieving the inventive reversal of the opening angle α at the balls in the first pairs of tracks when the joint is articulated. Adjoining the first arch with a first radius R2, towards the attaching end, the first outer ball tracks 22 increasingly deviate radially inwardly.

Please replace paragraph [0049] with the following amended paragraph:

[0049] Towards the aperture end, the circular arch with the radius R2 is followed, also steadily, around the center O1, by a circular arch with the radius R1 which is curved in the opposite direction and whose center OE is positioned outside the circle with the radius R2. That is, the track center lines M22 of the first outer ball tracks 22 of the first pairs of tracks, in the region adjoining the first arch with the first radius R2, towards the aperture end, increasingly deviate radially outwardly from said first radius R2. In accordance with the known geometrical laws, the center line M23 of the first inner ball track 23 (which is not shown in this Figure), with coinciding longitudinal axes La, Li, extends symmetrically relative to the center line M22 with reference to the central plane EM, and in all articulated positions of the joint, it remains symmetrical relative to the central line M22 with reference to the central ball plane EK which corresponds to an angle-bisecting plane EW between the longitudinal axes La, Li.

Please replace paragraph [0050] with the following amended paragraph:

[0050] Figure 6 shows the course taken by the second outer ball track 24 with the help of its center line M24. It comprises, centrally, a circular arch with the radius R5 around a center O3, with the circular arch extending towards the attaching end as far as the end of the ball track. Towards the aperture end, the circular arch is followed by a circular arch with a reversed curvature with the radius R4 whose center OA is positioned outside the circle with the radius R5. Thus, the track center lines M24 of the second outer ball tracks 24 of the second pairs of tracks, centrally, comprise a fifth arch with a fifth radius R5 whose center is offset by a third axial offset O3 from the central plane EM of the joint towards the aperture end and wherein, in the region adjoining said fifth arch towards the aperture end, they increasingly deviate radially outwardly from said fifth radius R5. The associated center line M25 of the second inner ball track 25 (which is not shown) shown in Figure 7D extends symmetrically relative to the illustrated center line M24 with reference to the central plane EM of the joint, with coinciding longitudinal axes La, Li, and, respectively, with a reference to the central ball plane EK in an articulated joint in all positions which corresponds to an angle-bisecting plane EW between the longitudinal axes La, Li. Thus, the track center lines M25 of the second outer ball tracks 25 of the second pairs of tracks, centrally, comprise a sixth arch with a sixth radius R5' whose center is offset by a fourth axial offset O4 from the central plane EM of the joint towards the attaching end, and that, in the region adjoining said sixth

U.S.S.N. 10/714,058

-7-

GKNG 1181 PUS

arch towards the attaching end, they increasingly deviate radially outwardly from said sixth radius R5'.

Please replace paragraph [0051] with the following amended paragraph:

[0051] Figure 7 shows a complete joint according to the preceding drawings, with corresponding parts having the same reference numbers. To that extent, reference is made to the preceding description. The joint is a six ball joint so that three first pairs of tracks 22, 23 alternate across the circumference, one of which is shown in section [[A-A]] B-B in the upper half of the Figure, and there are provided three second pairs of tracks 24, 25, one of which is shown in section [[A-A]] B-B in the lower half of the Figure. Figures 7C and 7D show a detail of the outer and inner joint part track formations, respectively. It can be seen in Figure 7D that the track center lines M23 of the first inner ball tracks 23, in the region of the second arch with the second radius R2', towards the attaching end, increasingly deviate outwardly from said second radius R2'. Adjoining the second arch, towards the aperture end, the first inner ball tracks 23 increasingly deviate radially inwardly from an arch having the second radius R2'.

Please replace paragraph [0052] with the following amended paragraph:

[0052] Figure 8 shows a joint which is similar to that shown in Figure 7, with equal similar details having been given the same reference numbers indexed by 100. To that extent, reference is made to the preceding description. However, the second pairs of tracks 24, 25 124, 125 are modified in that, following a first circular arch (with the radius R5), their center lines comprise a tangentially adjoining straight line instead of the circular arch curved in the opposite direction. The track shape shown ~~here~~ in Figure 8C thus corresponds to the track shape of standard UF joints.

Please replace paragraph [0053] with the following amended paragraph:

[0053] Figure 9 shows a joint which is similar to that shown in Figure 7, but there are provided eight pairs of tracks and eight balls, with first and second pairs of tracks alternating across the circumference. Reference numerals are indexed by 200. Figure 9B shows two first pairs of tracks 22, 23 222, 223 along section line [[A-A]] B-B of Figure 9A, and two second pairs of tracks 24, 25 224, 225 are shown in Figure 9C along section B-B of Figure 9A. Figures 9D and 9E show the track formation in detail.

U.S.S.N. 10/714,058

-8-

GKNG 1181 PUS

Please replace paragraph [0054] with the following amended paragraph:

[0054] Figure 10 shows a joint which, substantially, comprises the same details as the joint shown in Figure 9. To that extent, reference is made to the preceding description. In Figure 10, however, the reference numerals are indexed by 300. However, the second pairs of tracks 24, 25 324, 325 deviate in that the circular portions of their center lines (with the radius R5), instead of the circular arch curved in the opposite direction, are followed by tangential straight lines. The track shape thus corresponds to that of UF-type joints. Figures 10D and 10E show the track formations in detail.

Please replace paragraph [0057] with the following amended paragraph:

[0057] Figure 12 shows how in a conventional counter track joint with extreme articulation, all ball forces acting on the cage with reference to the joint articulation axis act on the cage in the same direction of rotation. The cage is subjected to high torque, as indicated by the rotating arrow. The joint tends to jam, thus, returning the joint to smaller articulation angles is either complicated or impossible. Corresponding parts have been indexed by 400. To that extent, reference is made to the preceding description.

Please replace paragraph [0058] with the following amended paragraph:

[0058] In Figures 11 and 12, as in Figures 2, 3 and 4, the axis of articulation is normal to the plane of drawing in the joint center M. Figure 11 differs from Figure 12 in that the form of track 22 differs with respect to track 422, with a corresponding difference in the inner tracks. The ball contact point (at F1), which is indicated by the arrow, clearly differs for the same joint operating angle. As a result of the track differences, the opening angle (α) of Figure 11 changes in sense of direction, whereas the joint of Figure 12 has an opening angle (α) which does not change in sense.